
Trends in Cancer Incidence in Allegheny County, Pennsylvania, 1937-71

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DETAILED INFORMATION ON CANCER INCIDENCE for relatively small geographic units, such as counties or census tracts, provides useful epidemiologic information for developing and testing etiological hypotheses. The Third National Cancer Survey, a project of the National Cancer Institute (NCI), is intended to provide data on cancer incidence for seven U.S. metropolitan areas and two entire States for the years 1969-71. The survey is a sequel to the Ten Cities Surveys of 1937 and 1947. Allegheny County in Pennsylvania was covered in all three of these surveys, and in addition, the county, which is part of the four-county Pittsburgh SMSA (standard metropolitan statistical area), was selected by NCI for another examination of cancer incidence in the period 1957-58. Therefore, it is possible to analyze changes in Allegheny County cancer incidence rates for four periods during a 34-year span. In this paper, we present the 1969-71 age-adjusted incidence rates by race, sex, and cancer site for Allegheny County and compare these more recent rates with the 1937, 1947, and 1957-58 Allegheny

County rates. We also compare corresponding estimates of U.S. cancer incidence rates for 1937, 1947, and 1969-71. In future papers, we will consider intracounty variation in relation to various census characteristics, as a further basis for exploring the epidemiology of cancer of specific sites.

Survey Methods

Detailed information regarding the 1969-71 survey design and operation are described in the National

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Cancer Institute's monograph—Third National Cancer Survey: Incidence Data (1). Information on the methodology of the earlier surveys of 1937, 1947, and 1957–58 also is available elsewhere (2–5). Generally, cases were identified from hospital charts, pathology reports, autopsy reports, radiotherapy records, outpatient clinic records, tumor registries, medical record indexes, and copies of death certificates that mentioned cancer as a cause of death.

Rates in this paper from the 1969–71 survey refer to newly diagnosed cases of primary invasive cancer in residents of Allegheny County. Persons in whom cancer was diagnosed at more than one primary site during the survey period are included in the totals for each site. Thus, the total number of cases for all sites combined is somewhat greater than the number of persons involved. In order to make comparisons with the earlier surveys, all incidence rates for the 1969–71 survey are age adjusted to the 1950 U.S. population. These age-adjusted incidence rates, expressed per 100,000 population, are based on race-sex-specific values for 5-year age groups. Incidence rates presented for prior surveys in Allegheny County and the United States as a whole also are age adjusted to the 1950 U.S. population, except that for 1937, the only Allegheny County rates available are age adjusted to the estimated 1947 U.S. population.

A total of 16,693 reports of cancer incidence were received from hospitals and other sources from 1969 to 1971 (6, 7). A substantial majority (95.1 percent) of the new cancer cases were identified from hospi-

tal records, and the data on the other cases were obtained from physicians' reports (0.5 percent) and from death certificates (4.4 percent). The proportion identified from hospital records was fairly consistent across the major cancer sites.

The number of cancer cases (excluding cases identified only from death certificates) and the percentage of cases confirmed by microscopic examination in the three survey periods of 1947, 1957–58, and 1969–71 are given in table 1 (1937 numbers were not available). There was microscopic confirmation of cancer in 90.5 percent of the cases in the 1969–71 survey. This percentage represents a substantial increase over the percentage of cases confirmed in 1947 (69.0 percent) and a slight increase over the percentage confirmed in the years 1957–58 (85.9 percent). The percentages of confirmed cases, by site, for the 1969–71 survey ranged from a low of 84.3 for respiratory system cancer to a high of 99.0 for soft tissue cancer.

Following the usual approach, in succeeding tables we have combined cancer cases in which the disease was microscopically diagnosed with those that were clinically diagnosed. Survival rates for patients whose cases are clinically diagnosed have been found to be substantially lower than those for patients whose cases are microscopically confirmed (8, 9), a result indicating that for clinically diagnosed cases biopsy is unnecessary or inadvisable. Thus, clinically diagnosed cases should be included with microscopically confirmed cases.

Table 1. Number of cancer cases among residents of Allegheny County, Pa., by primary site, with percentage microscopically confirmed, 1947, 1957–58, and 1969–71

Primary site and ICDA number (8th revision)	1947		1957–58		1969–71	
	Total cases ¹	Percent confirmed	Total cases ¹	Percent confirmed	Total cases ¹	Percent confirmed
All sites	2,979	69.0	7,726	85.9	15,965	90.5
Buccal cavity and pharynx . . . 140–149 . . .	150	79.3	317	92.1	524	96.9
Digestive system 150–159 . . .	1,018	61.0	2,389	81.9	4,429	87.4
Respiratory system 160–163 . . .	265	57.7	942	79.5	2,554	84.3
Breast 185–187 . . .	394	86.0	1,100	93.0	2,188	96.2
Female genital organs 180–184 . . .	470	83.0	958	94.2	1,543	97.6
Male genital organs 185–187 . . .	178	56.1	543	82.3	1,166	87.7
Urinary organs 188–189 . . .	194	73.7	537	92.0	1,091	94.5
Brain and nervous system 191–192 . . .	56	66.1	148	91.2	217	89.4
Endocrine glands 193–194 . . .	40	72.5	96	94.8	180	98.3
Bone 170 . . .	31	58.1	39	82.1	46	95.7
Soft tissue 171 . . .	21	90.5	73	97.3	99	99.0
Other sites 199 . . .	162	53.7	584	75.5	1,928	90.2

¹ Excludes skin cancers, leukemias, lymphomas, and cases identified only by death certificate.

Results

Cancer incidence rates, 1969-71. Age-adjusted incidence rates per 100,000 at risk for the 1969-71 survey period are shown in table 2. For all sites combined, the male rate is substantially higher than the female rate. The rate for black males is much higher than the rate for white males (382.3 versus 309.4), but the black female rate is only slightly higher than that for white females (264.9 versus 252.5).

The incidence rate for cancer of the lung, bronchus, and trachea for black males is higher than the rate for white males (99.4 versus 69.7). The rate for black females, however, nearly equals the white female rate (14.5 compared with 15.0). Female rates remain much lower than male rates.

A similar pattern of differences in incidence rates between blacks and whites can be seen for cancer of the stomach. Again, the black male rate (21.1) is higher than that for white males (15.3). Black female and white female rates are about equal. For

all races combined, male rates are twice as great as female rates.

Male incidence rates for colon cancer are greater for whites than blacks (33.5 versus 23.2). However, the black female rate of 33.7 per 100,000 is higher than the 27.5 rate for white females. For cancer of the rectum and rectosigmoid junction, incidence rates for white and black males are similar and are higher than the corresponding female rates. The black female rate of 13.9 is only slightly more than the white female rate of 11.4.

The most striking differences between the rates of blacks and whites are for cancers of the cervix, prostate, and esophagus (table 2). The invasive cervical cancer incidence rate for black women is approximately two times greater than the white rate (27.4 versus 13.2). Prostate cancer rates are also twice as great for blacks as for whites (72.7 versus 37.2). The incidence rates for black males and black females for esophageal cancer (21.1 and 6.2, respec-

Table 2. Age-adjusted cancer incidence rates per 100,000 population, Allegheny County, Pa., 1969-71, by primary site, race, and sex

Primary site and ICDA number (8th revision)	All races		White		Black	
	Male	Female	Male	Female	Male	Female
All sites	315.2	254.0	309.4	252.5	382.3	264.9
Lip, tongue, gum, and mouth .. $\left\{ \begin{array}{l} 140, 141, \\ 143, 144, \\ \text{and } 145 \end{array} \right\}$	9.7	2.3	9.7	2.3	10.2	3.3
Pharynx	3.2	0.6	3.3	0.5	1.7	0.9
Esophagus	6.8	1.5	5.6	1.1	21.1	6.2
Stomach	15.9	7.0	15.3	7.0	21.1	7.4
Colon	32.6	27.9	33.5	27.5	23.2	33.7
Rectum and rectosigmoid junction	18.8	11.5	18.8	11.4	18.6	13.9
Liver	3.1	1.1	3.0	1.1	4.0	0.8
Gallbladder	0.8	2.2	0.9	2.2	0.9	2.0
Pancreas	11.2	6.0	10.7	5.9	16.8	7.4
Larynx	7.8	1.2	7.9	1.1	5.5	1.3
Lung, bronchus, and trachea	71.8	14.9	69.7	15.0	99.4	14.5
Breast	0.8	71.5	0.7	72.4	1.3	60.8
Cervix .....	...	14.3	...	13.2	...	27.4
Corpus and unspecified uterus .....	...	21.5	...	22.1	...	13.6
Ovary .....	...	12.5	...	12.7	...	11.2
Prostate	40.3	...	37.2	...	72.7	...
Testis and penis	4.1	...	4.4	...	1.0	...
Bladder	21.2	6.4	22.3	6.5	11.4	4.3
Kidney	6.7	3.3	6.6	3.3	8.2	3.7
Bones and joints	1.0	0.9	1.1	0.7	...	2.1
Soft tissue	2.3	1.5	2.2	1.4	3.2	2.0
Brain and nervous system	5.5	3.3	5.7	3.3	4.0	3.6
Thyroid	1.5	5.1	1.6	5.1	0.9	5.0
Lymphomas	9.5	7.0	9.5	7.1	8.7	6.3
Leukemias	10.7	6.3	10.8	6.6	10.4	3.1
Melanomas—skin	3.3	3.2	3.4	3.3	1.4	0.9
Other and unspecified sites	26.6	21.0	25.5	19.7	36.6	29.5

tively) are substantially higher than the corresponding white male and female rates (5.6 and 1.1).

Trends in cancer incidence. Tables 3 and 4 present the age-adjusted incidence rates and average annual rates of change for Allegheny County males and females of all races over the four survey periods from 1937 to 1971. (Race-specific rates were not available for all survey years). These tables reveal a steady average annual increase over time in male incidence rates for all sites combined and a slight average annual decrease for females. The average annual rate of change of 1 percent in male cancer incidence for the interval 1957-58 to 1969-71 is equal to the rate of change for the 1947 to 1957-58 interval for males, while the average annual rates of change in the two periods are almost equal for females (-0.3 percent and -0.4 percent).

Comparison of the Allegheny County incidence rates for all sites, excluding skin cancer, leukemias, and Hodgkin's disease, with U.S. rates (fig. 1) shows

Figure 1. Age-adjusted cancer incidence rates per 100,000 population, for all sites combined and for the lung, bronchus, and trachea, by sex, based on surveys of Allegheny County and the United States, 1937-71

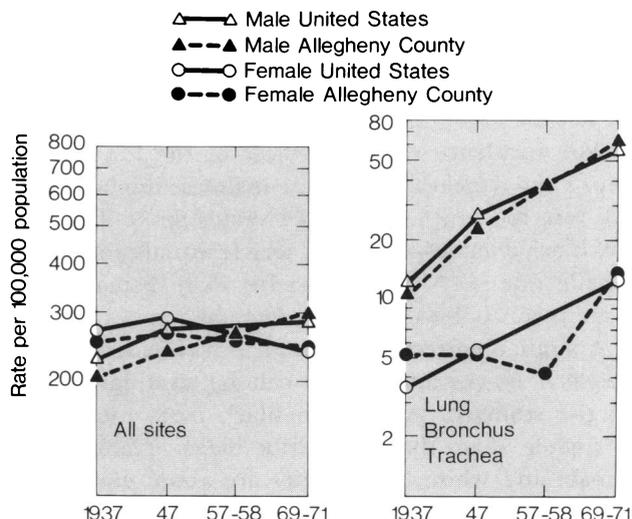


Table 3. Age-adjusted cancer incidence rates per 100,000 males and average annual rates of change, by primary site, Allegheny County, Pa., 1937, 1947, 1957-58, and 1969-71

Primary site and ICDA number (8th revision)	Age-adjusted rate				Average annual percentage rate of change		
	1937	1947	1957-58	1969-71	1937 to 1947	1947 to 1957-58	1957-58 to 1969-71
All sites ¹	205.9	249.0	276.4	311.9	+ 1.9	+ 1.0	+ 1.0
Buccal cavity and pharynx140-149 . . .	15.1	16.6	15.7	15.7	+ 1.0	- 0.5	0.0
Digestive system150-159 . . .	105.5	103.7	90.3	92.8	- 0.2	- 1.3	+ 0.2
Esophagus150 . . .	5.2	6.7	7.7	6.8	+ 2.6	+ 1.3	- 1.0
Stomach151 . . .	43.8	31.5	20.6	15.9	- 3.2	- 4.0	- 2.1
Colon (excluding rectum)153 . . .	² 22.6	27.6	26.9	32.6	+ 2.0	- 0.2	+ 1.5
Rectum and rectosigmoid junction154 . . .	15.0	20.6	18.0	18.8	+ 3.2	- 1.3	0.0
Pancreas157 . . .	6.7	6.4	(³)	11.2	- 0.5	...	...
Respiratory system160-163 . . .	17.7	34.7	51.4	80.7	+ 7.0	+ 3.8	+ 3.7
Larynx161 . . .	4.6	7.9	8.2	7.8	+ 5.6	+ 0.4	- 0.4
Lung, bronchus, and trachea162 . . .	10.6	24.9	41.8	71.8	+ 8.9	+ 5.1	+ 4.4
Breast174 . . .	1.0	0.4	0.9	0.8	- 8.8	+ 8.0	- 0.9
Genital organs185-187 . . .	26.5	31.9	36.4	44.5	+ 1.9	+ 1.3	+ 1.6
Prostate185 . . .	22.0	28.5	31.7	40.3	+ 2.6	+ 1.0	+ 1.9
Urinary organs188-189 . . .	15.8	20.9	22.6	28.4	+ 2.8	+ 0.7	+ 1.8
Kidney189 . . .	3.6	4.1	4.7	6.7	+ 1.3	+ 1.3	+ 2.9
Bladder188 . . .	11.8	16.3	17.9	21.2	+ 3.3	+ 0.9	+ 1.4
Eye190 . . .	(³)	(³)	0.5	0.5	...	...	0.0
Brain and nervous system191-192 . . .	4.6	6.0	5.4	5.5	+ 2.7	- 1.0	+ 0.1
Endocrine glands193-194 . . .	(³)	1.8	1.6	1.7	...	- 1.1	+ 0.5
Bone170 . . .	5.4	3.3	1.6	1.0	- 4.8	- 6.7	- 3.7
Soft tissue171 . . .	(³)	1.1	2.2	2.3	...	+ 6.8	+ 0.4
Leukemias204-207 . . .	(⁴)	6.3	9.5	10.7	...	+ 4.0	+ 1.0
Lymphomas200-203 . . .	(⁴)	9.8	14.2	9.5	...	+ 3.6	- 3.2
Hodgkin's disease201 . . .	(⁴)	2.4	3.5	4.3	...	+ 3.7	+ 1.7
Other and unspecified199 . . .	14.3	12.5	24.1	17.8	- 1.3	+ 6.5	- 2.4

¹ Excludes skin. ² Includes small intestine. ³ Not available ⁴ Leukemias and Hodgkin's disease not reported in 1937 survey; other lymphomas, if reported, were classified by site.

that rates for Allegheny County females have decreased more slowly than U.S. female rates, while rates for males in the county have risen faster than the rates for U.S. males. For both sexes, the Allegheny County and U.S. rates are closer in the latest survey than they have been in previous survey years.

Cancers of the lung, bronchus, and trachea account for the largest average annual increase in cancer incidence in Allegheny County, both among males and females. Among males, rates for these cancers exhibit annual increases for the three periods 1937 to 1947, 1947 to 1957-58, and 1957-58 to 1969-71, although the rate of increase appears to be declining somewhat. The annual rate of increase for the years 1957-58 to 1969-71 is 4.4 percent. For females, there is a striking average annual increase of 9.3 percent for the 1957-58 to 1969-71 interval, following a decline in incidence in the previous period. Figure 1 reveals that trends in lung, bronchus, and trachea incidence rates for males in Allegheny

County are similar to the trends for males in the United States. Although incidence rates for U.S. females are not available for 1957 through 1958, mortality rates indicate a sharp increase for this group after those years (10).

Stomach cancer incidence rates have decreased for both sexes in Allegheny County, although females show a larger annual decrease for the years 1957-58 to 1969-71 (-4.0 percent for females and -2.1 percent for males). Figure 2 shows that the Allegheny County age-adjusted incidence rates for stomach cancer have not declined as much as comparable U.S. rates.

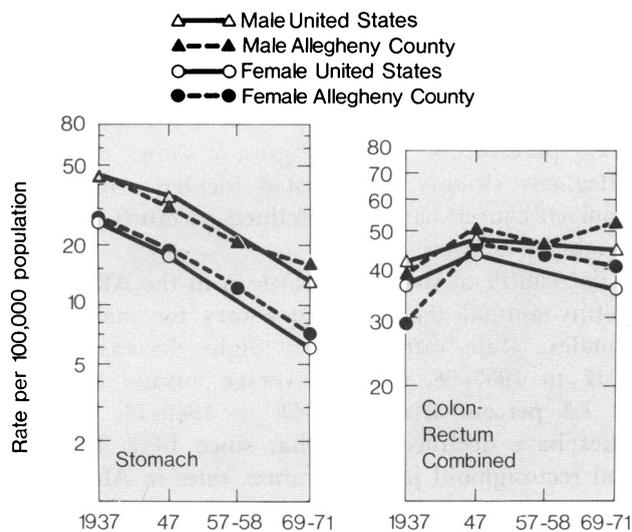
For cancer of the colon, patterns in the Allegheny County annual incidence rates vary for males and females. Male rates show a slight decrease from 1947 to 1957-58, but an average annual increase of 1.5 percent from 1957-58 to 1969-71. Female rates have declined somewhat since 1947. Rectum and rectosigmoid junction cancer rates in Allegheny

Table 4. Age-adjusted cancer incidence rates per 100,000 females and average annual rates of change, by primary site, Allegheny County, Pa., 1937, 1947, 1957-1958, and 1969-71

Primary site and ICDA number (8th revision)	Age-adjusted rate				Average annual percentage rate of change		
	1937	1947	1957-58	1969-71	1937 to 1947	1947 to 1957-58	1957-58 to 1969-71
All sites ¹	251.0	273.7	261.5	250.8	+ 0.8	- 0.4	- 0.3
Buccal cavity and pharynx 140-149 . . .	4.5	5.2	4.2	4.0	+ 1.5	- 2.0	- 0.4
Digestive system 150-159 . . .	75.8	82.7	69.3	60.5	+ 0.9	- 1.7	- 1.1
Esophagus 150 . . .	0.9	1.8	1.3	1.5	+ 7.2	- 3.1	+ 1.2
Stomach 151 . . .	28.7	18.5	11.7	7.0	- 4.3	- 4.3	- 4.0
Colon (excluding rectum) 153 . . .	² 20.5	30.6	28.9	27.9	+ 4.1	- 0.5	- 0.3
Rectum and rectosigmoid junction 154 . . .	7.4	14.4	13.4	11.5	+ 6.9	- 0.7	- 1.2
Pancreas 157 . . .	3.5	5.6	⁽³⁾	6.0	+ 4.8	...	...
Respiratory system 160-163 . . .	6.8	7.4	5.8	16.6	+ 0.8	- 2.3	+ 8.8
Larynx 161 . . .	0.5	0.8	0.5	1.2	+ 4.8	- 4.4	+ 7.3
Lung, bronchus, and trachea 162 . . .	5.4	5.6	4.9	14.9	+ 0.4	- 1.3	+ 9.3
Breast 174 . . .	59.3	61.6	65.6	71.5	+ 0.4	+ 0.6	+ 0.7
Genital organs 180-184 . . .	71.8	68.7	58.0	51.0	- 0.4	- 1.6	- 1.0
Cervix 180 . . .		31.0	20.4	14.3	...	- 3.9	- 2.8
Corpus and other uterus 181-182 . . .	⁴ 56.1	24.0	21.9	21.5	...	- 0.9	- 0.1
Ovary 183 . . .	11.5	10.3	11.3	12.5	- 1.1	+ 0.9	+ 0.8
Urinary organs 188-189 . . .	10.4	11.3	10.4	10.1	+ 0.8	- 0.8	- 0.2
Kidney 189 . . .	2.6	1.9	3.0	3.3	- 0.3	+ 4.4	+ 0.8
Bladder 188 . . .	7.2	9.0	7.3	6.4	+ 2.3	- 2.0	- 1.0
Eye 190 . . .	⁽³⁾	⁽³⁾	0.6	0.9	...	...	+ 3.3
Brain and nervous system 191-192 . . .	3.2	3.4	4.7	3.3	+ 0.6	+ 3.1	- 2.8
Endocrine glands 193-194 . . .	⁽³⁾	3.6	4.3	5.4	...	+ 1.7	+ 1.8
Bone 170 . . .	3.8	2.0	0.9	0.9	- 6.2	- 7.3	0.0
Soft tissue 171 . . .	⁽³⁾	1.3	2.2	1.5	...	+ 5.1	- 3.0
Leukemias 204-207 . . .	⁽⁵⁾	4.9	5.9	6.3	...	+ 1.8	+ 0.5
Lymphomas 200-203 . . .	⁽⁵⁾	7.2	9.0	7.0	...	+ 2.1	- 2.0
Hodgkin's disease 201 . . .	⁽⁵⁾	1.2	2.9	3.0	...	+ 8.8	+ 0.3
Other and unspecified 199 . . .	14.6	14.4	20.6	11.8	- 0.1	+ 3.5	- 4.4

¹ Excludes skin. ² Includes small intestine. ³ Not available. ⁴ Includes all cancers of uterus. ⁵ Leukemias and Hodgkin's disease not reported in 1937 survey; other lymphomas, if reported, were classified by site.

Figure 2. Age-adjusted cancer incidence rates per 100,000 population, for stomach and colon-rectum combined, by sex, based on surveys of Allegheny County and the United States, 1937-71



County have decreased steadily for females but appear to be leveling off for males. Because of past inconsistencies in classification of tumors occurring near the rectosigmoid junction (11), in figure 2 we have combined rates for cancers of the colon and rectum to permit comparison with U.S. rates (U.S. rates for 1937 include cancer of the small intestine). Colorectal cancer rates for Allegheny County females have not decreased as rapidly as U.S. female rates, while male rates, although increasing in Allegheny County, have decreased in the United States as a whole.

Female breast cancer rates display a slow, steady increase of about 0.6 percent per year for Allegheny County, but have remained fairly constant for the United States in the interval from 1947 to 1969-71 (fig. 3). Breast cancer incidence rates in the United States and Allegheny County are nearly equal in the 1969-71 interval.

Invasive cervical cancer rates exhibit sharp decreases since 1947 in Allegheny County, although the annual rate of decrease from 1957-58 to 1969-71 (-2.8 percent) is not as large as the decrease from 1947 to 1957-58 (-3.9 percent). A comparison of the rates for invasive cancers of all parts of the uterus reveals similar trends for Allegheny County and the United States (fig. 3). There is insufficient information on subsite cancers in earlier years to permit separate comparisons.

Rates for cancer of the prostate show continuous increases for Allegheny County males since 1937.

The U.S. rates present a similar trend, although they are consistently higher than Allegheny County rates (fig. 4).

For bladder cancer, the trends are not alike for men and women. Male rates for both Allegheny County and the United States have increased since 1937, while female rates have decreased (fig. 4).

From 1957-58 to 1969-71, female incidence rates for cancer of the esophagus in Allegheny County

Figure 3. Age-adjusted cancer incidence rates per 100,000 females, for breast and uterus, based on surveys of Allegheny County and the United States, 1937-71

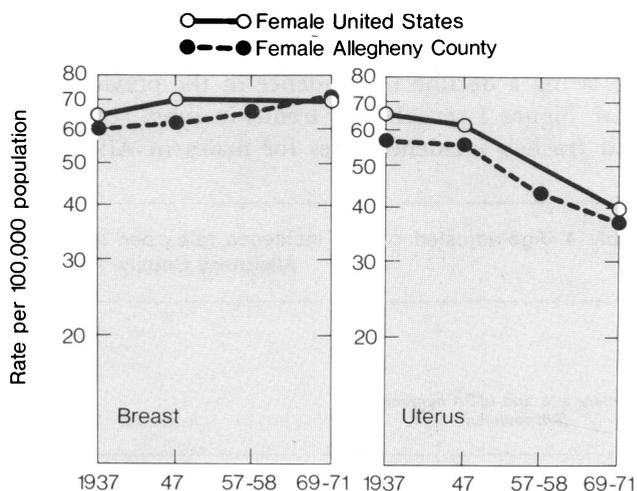
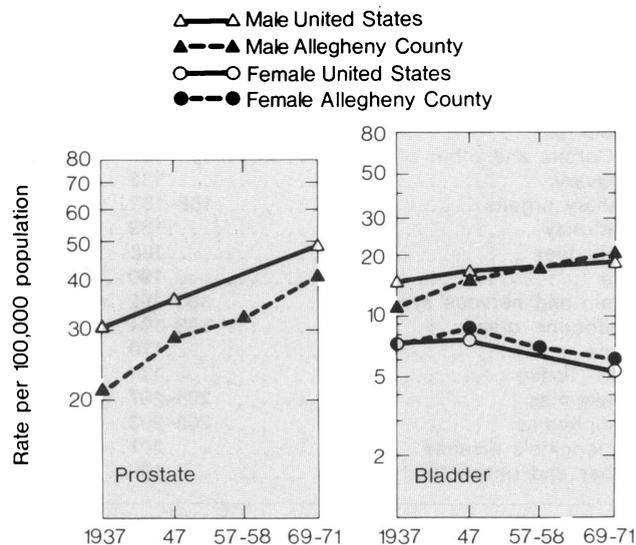


Figure 4. Age-adjusted cancer incidence rates per 100,000, population, for prostate and bladder, by sex, based on surveys of Allegheny County and the United States, 1937-71



increased by 1.2 percent annually, while overall rates for males declined. Since 1937, however, rates for both sexes in Allegheny County have risen, while U.S. rates have dropped (fig. 5). Although race-specific rates are not available for all periods for Allegheny County, U.S. incidence rates for blacks for esophageal cancer have increased from 1937 to 1969-71. Incidence rates for U.S. white males have declined, while white female rates have remained fairly constant (11).

Pancreatic cancer rates show increases for both Allegheny County men and women over time, although male rates have risen faster than female rates since 1947. U.S. rates also have increased (fig. 5).

Discussion

There apparently have been changes in cancer incidence rates from 1937 to 1969-71 for all sites considered. Such changes usually are hypothesized as being due to changes in eating, drinking, and smoking practices, to changes in occupational or other environmental exposures, to differences in classification and diagnostic procedures, or to a combination of these factors. However, for most sites it is difficult to relate changes in incidence to changes in these factors, for one or both of the following reasons:

1. Epidemiologic or laboratory studies of the relationship between a possible factor and cancer are inconclusive or contradictory.

2. Data regarding changes in a known factor are not available.

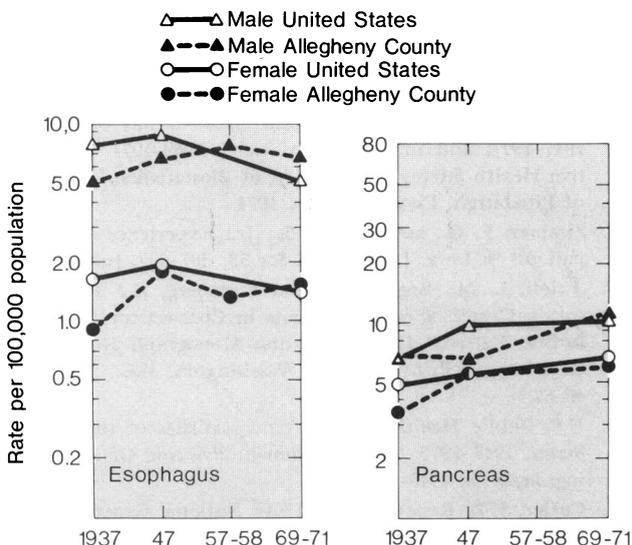
Allegheny County may generally be characterized as a heavily industrialized urban area. Included among its industries are several large steel plants and other heavy metal plants. Its largest city, Pittsburgh, houses approximately one-third of the total county population. There has been a small net decline in recent years in the total county population, following steady increases from 1930 to 1960. Income levels and the percentage of foreign stock remain higher in Allegheny County than in the United States as a whole.

Unfortunately, we could not analyze trends in race-specific incidence of cancer. However, differences in racial composition probably do not account for the differences between Allegheny County and the United States in incidence trends. Approximately 9 percent of the county population is now black, a proportion slightly below the percentage of blacks in the United States. Small differences between the percentage of blacks in the county and U.S. populations also exist for prior survey years (12-15). The percentage of blacks in both the county and U.S. populations has risen slowly over time. In a summary of race-specific trends in cancer incidence for the United States, Cutler and Devesa (16) noted differences between white and black trends for several sites, including colon-rectum, prostate, pancreas, esophagus, and ovaries.

The most dramatic increase in incidence rates for all races in Allegheny County from 1957-58 to 1969-71 is for cancer of the lung, bronchus, and trachea. The increase approximates the U.S. rise. The rate of increase, however, appears to be decreasing for both sexes in the United States and for males in Allegheny County.

Smoking has been associated with lung cancer in innumerable studies. In one study, Burbank (17) analyzed mortality rates and data regarding cigarette consumption in the years 1920-68. He postulated that lung cancer trends can be explained by a dose-response model having a latency period of approximately 30 years. Analysis of increases in female consumption of cigarettes could explain the higher percentage increase in female lung cancer mortality since 1960 as compared with male lung cancer mortality. Table 4 shows that the average annual rate of increase in the incidence of respiratory system cancer for females in Allegheny County from 1957-58 to 1969-71 has exceeded the rate of increase for males, a result which is in agreement with Burbank's data on death rates.

Figure 5. Age-adjusted cancer incidence rates per 100,000 population, for esophagus and pancreas, by sex, based on surveys of Allegheny County and the United States, 1937-71



Air pollution also has been implicated as a factor in lung cancer incidence. Stocks (18) and Buell and associates (19) showed that even after adjustments for smoking differences, urban areas had higher lung cancer mortality than rural areas. Henderson and associates (20) reported a correlation between the geographic distribution of lung cancer cases and industries that emit certain pollutants.

The drop in stomach cancer incidence also appears to be real, since there has been a consistent decline in both Allegheny County and the United States since 1937. The percentage of microscopically confirmed cancer cases in Allegheny County in the years 1957-58 for all digestive organs was 81.9, while in the years 1969-71 it was 87.4. This finding does not rule out the possibility that changes in diagnostic criteria account for at least some of the decrease in stomach cancer. Haenszel (21) has expressed the belief that the national decrease is not due solely to advanced diagnostic techniques. Terris and Hall (22) suggest that the decrease may be due primarily to changes in diet. The total Pittsburgh SMSA displayed the highest age-adjusted incidence of stomach cancer of the nine areas surveyed in the period 1969-71. In a future paper, we will consider the variation in incidence among those areas in the Pittsburgh SMSA that differ with respect to several demographic variables.

Differences in incidence rates for cancer of the colon have been associated with socioeconomic status and diet (23, 24). However, it would be difficult to relate these factors to trends in the incidence of this disease in Allegheny County; rates for males in the interval 1957-58 to 1969-71 increased, while rates for females were fairly stable.

An intriguing rise in breast cancer incidence rates in Allegheny County has occurred for the 1937 to 1969-71 interval. This rise is in contrast to the trend for the U.S. rates, which have remained relatively stable. It should be noted, however, that the level of the rate in Allegheny County has remained below the level of the U.S. rate. The percentage of cases microscopically confirmed in 1947 was 86.0, compared with 96.2 in the years 1969-71, a proportion indicating that misclassification probably does not contribute greatly to the increase.

Many authors postulate that differences in breast cancer incidence may be associated with differences in such factors as the woman's age at first full-term pregnancy and her age at menarche (25-27). These associations and others suggest that endocrine and genetic factors play a role in the development of breast cancer.

Differences in incidence rates for cancer of the prostate may be associated with genetic or socio-cultural variables (28, 29). The sharp increase in incidence rates since 1937 demonstrates the need for further research.

Bladder cancer incidence rates continue to rise for males and to decline for females. The most commonly implicated causes of bladder cancer are smoking and certain occupational exposures (30). However, female rates have shown a decline since 1947, which might not be expected in view of the greater numbers of females smoking and, also, their possibly increased occupational exposure.

Cancers of the esophagus and pancreas show increases in overall incidence since 1937. Diet is hypothesized as playing a role in the development of both of these cancers (31, 32). In addition, esophageal cancer is associated with tobacco use and the consumption of strong alcoholic beverages.

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SYNOPSIS

EMES, JACK J. (University of Pittsburgh), REDMOND, CAROL K., and JARMOLOWSKI, NANCY: *Trends in cancer incidence in Allegheny County, Pennsylvania, 1937-71. Public Health Reports, Vol. 92, July-August 1977, pp. 365-373.*

Cancer incidence rates by race, sex, and cancer site were obtained from the Third National Cancer Survey for the years 1969-71 for residents of Allegheny County, Pennsylvania. When the sex-site-specific rates for 1969-71, as well as incidence rates from surveys in the county in 1937, 1947, and 1957-58, were compared with U.S. rates for 1937, 1947, and 1969-71, a number of significant changes in incidence were observed.

Male incidence of cancers of the lung, bronchus, and trachea increased steadily between 1937 and 1969-71

both in Allegheny County and the United States. In the county, female incidence rates for these cancers decreased in the period 1947 to 1957-58 but showed an average annual increase of 9.2 percent in the interval 1957-58 to 1969-71. Incidence rates for county males increased by an average of 4.4 percent per year from 1957-58 to 1969-71. For stomach cancer, incidence rates for both sexes have decreased sharply in the county and in the United States. In the county, stomach cancer rates for females declined by an annual average of 4 percent from 1957-58 to 1969-71, while those for males dropped 2.1 percent.

There appears to have been a steady decline over time in cervical cancer in Allegheny County, although the average annual rate of decrease of 2.8 percent for the latest interval

(1957-58 to 1969-71) is not as large as the decrease of 3.9 percent per year from 1947 to 1957-58. Breast cancer rates for the county appear to have been steadily, although slowly, increasing at an average rate of about 0.6 percent per year, in contrast to almost constant U.S. rates. The county's breast cancer incidence rate for 1969-71 almost equals the U.S. rate. There have been steady increases in prostate cancer incidence in both Allegheny County and the United States since 1937.

For all sites combined, male cancer incidence rates increased, while those for females slowly decreased in both Allegheny County and the United States during the interval 1937 to 1969-71. In the county, male rates for the interval 1937 to 1969-71 increased an average of 1 percent per year, while female rates declined approximately 0.3 percent annually.